the surface of the sea in 1868; this, too (one of the northernmost promontories of Iceland), has frequently been visited by violent earthquakes, notably so in 1872. Towards the east the island rises precipitously out of the sea to the height of upwards of 300 feet, but slopes to the westward, where all the habitations of the people are scattered about. The flora is scanty, and the plants stunted in a remarkable degree; as far as I had opportunity to observe, the vegetation seemed to bear a distinct Arctic impress as compared with that of the mainland. The sward is covered with Arctic willow (*Salix herbacea*), resembling the same plant when met with on the mainland at an elevation of 1500 to 2000 feet above the sea-level. The flora of the eastern portion of the island is much more varied, as compared with that of the western, owing to the soil being much more fertile there from the guano deposited by the multitudes of birds which haunt that part of the island. Every ledge of rock is covered with the so-called "Skarfa-kál" (scurvy-kale, scurvy-grass, or spoon-wort, *Cochlearia officinalis*). Altogether I managed to collect here between fifty and sixty species of plants, all of which are also found on the mainland, only these are of a more stunted growth. No heath vegetation occurred, and no ligneous, if I except the above mentioned willow, which only grows to the height of one inch and a half.

The temperature of Grimsey is much milder than might be supposed from the geographical position of the island. Although it is visited every two out of three years by the Arctic ice, the average temperature of the year is + 1°·4 Celsius. August is the hottest month in the year, + 7½° C.; March the coldest, − 3½° C. The highest degree of heat in 1876 was + 20° C.; the greatest cold in 1880, − 30° C. The mildness of the temperature is accounted for by the fact, ascertained of late years beyond a doubt, that a small branch of the Gulf Stream splits off from the main current on encountering the resistance of the western submarine spurs of the rocky masses on which Iceland is built up, the flow of which branch, on wheeling round the north-western peninsula of the country, takes an eastward direction along the whole extent of the northern coast. The average temperature of the sea round Grimsey is about 4° C. in January and 3° C. in February. The pastor of the island, M. Pjetur Gudmundsson, has for many years been engaged in exceedingly careful meteorological observations on behalf of the Meteorological Institute of Copenhagen. This most worthy gentleman, living here in conspicuous poverty, like a hermit divorced from the world, though he has the comfort of a good wife to be thankful for, is not only regarded as a father by his primitive congregation, but enjoys moreover the reputation of being in the front rank among sacred poets in modern Iceland.

The inhabitants derive their livelihood, for the most part, from bird-catching, nest-robbing, and deep-sea fisheries. The precipices that form the eastern face of the island are crowded with myriads of various kinds of sea-fowl. On every ledge the birds are seen thickly packed together; the rocks are white with guano, or green-tufted with scurvy-grass; here everything is in ceaseless movement, stir, and flutter, accompanied by a myriad-voiced concert from screamers on the wing, from chatterers on domestic affairs in the rock-ledges, and from brawlers at the parliament of love out at sea, the surface of which beneath the rocks is literally thatched at this time of the year with the wooing multitudes of this happy commonwealth. If the peace is broken by a stone rolled over the precipice, or by the report of a gun-shot, the air is suddenly darkened by the rising clouds of the disturbed birds, which, viewed from the rocks, resemble what might be taken for gigantic swarms of bees or midges.

The method adopted for collecting eggs is the following:—Provided with a strong rope, some nine or ten stalwart men go to the precipice, where it is some 300 feet high, and one of the number volunteers or is singled out by the rest for the perilous "*sig*," *i.e.* "sink," or "drop," over the edge of the rocks. Round his thighs and waist, thickly padded generally with bags stuffed with feathers or hay, the "*sigamadr*," "sinkman," or "dropman," adjusts the rope in such a manner as to hang, when dropped, in a sitting posture. He is also dressed in a wide smock or sack of coarse calico, open at the breast, and tied round the waist with a belt, into the ample folds of which he slips the eggs he gathers, the capacity of the smock affording accommodation to from 100 to 150 eggs at a time. In one hand the "sinkman" holds a pole, 16 feet long, with a ladle tied to one end, and by this means scoops the eggs out of nests which are beyond the reach of his own hands. When the purpose of this "breath-fetching" "sink" is accomplished, on a given sign the "drop-man" is hauled up again by his comrades. This, as may readily be imagined, is a most dangerous undertaking, and many a life has been lost over it in Grimsey from accidents occurring to the rope.[1]

For the pursuit of the fishery the island possesses fourteen small open boats, in which the men will venture out as far as four to six miles cod-fishing; but this is a most hazardous industry, owing both to the sudden manner in which the sea will rise, sometimes even a long time in advance of travelling storms, and to the difficulty of effecting a landing on a harbourless island.

Now and then the monotony of the life of the inhabitants is broken by visits from foreigners, mostly Icelandic shark-fishers, or English or French fishermen.

Of domestic animals the islanders now possess only a few sheep. Formerly there were five cows in the island, but the hard winter of 1860 necessitated their extermination, and since that time, for twenty-four years, the people have had to do without a cow! Of horses there are only two at present in the island! Strange to say, the health of the people seems, on the whole, to bear a fair comparison with more favoured localities. Scurvy, which formerly was very prevalent, has now almost disappeared, as has also a disease peculiar to children, which, in the form of spasm, or convulsive fit, used to be very fatal to infant life in former years.

Inexpressibly solitary must be the life of these people in winter, shut out from all communication with the outer world, and having in view, as far as the eye can reach, nothing but Arctic ice. The existence of generation after generation here seems to be spent in one continuous and unavailing Arctic expedition. The only diversion afforded by nature consists in the shifting colours of the flickering aurora borealis, in the twinkling of the stars in the heavens, and the fantastic forms of wandering icebergs. No wonder that such surroundings should serve to produce a quiet, serious, devout, and down-hearted race, in which respect the Grimsey men may perhaps be said to constitute a typical group among their compatriots. However, to dispel the heavy tedium of the long winter days, they seek their amusements in the reading of the Sagas, in chess-playing, and in such mild dissipations at mutual entertainments at Christmas-time as their splendid poverty will allow.

TH. THORODDSEN

SEATS IN RAILWAY CARRIAGES

IN a recent article in *Science et Nature* the writer, after animadverting on the lateness of the day at which shoemakers have at length begun, though still very imperfectly, to take account of the osseous framework of the human foot, proceeds to investigate the relation between

[1] This is a fate that befalls too many of the "sinkmen" of Iceland, for there are numbers of them all round the coast. It would be easy, at a very small cost to the treasury of Iceland, to provide a perfectly safe movable apparatus for every district where life must be sustained at the above-described risk. The authorities would, no doubt, readily meet any reasonable request on the subject.—E. M.

the structure of the human trunk and that of the seat, more particularly in railway carriages, designed for its accommodation. In a sitting posture the pelvis has for its sole function the support of the upper part of the

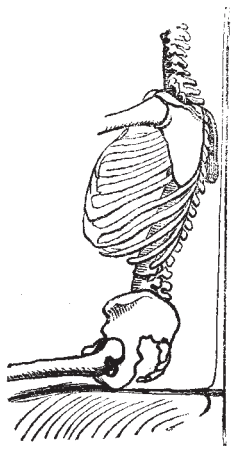

FIG. 1.

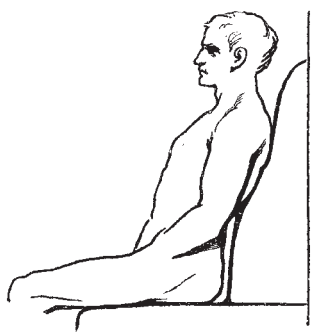

FIG. 2.

body. The spinal column, however, is inserted in the pelvis, not in the form of a straight line but of a curve (Fig. 1). This inflection on the part of the backbone, while adding to the mobility of the trunk, imposes on it

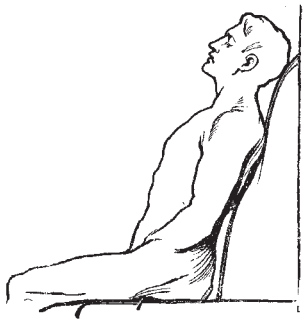

FIG. 3.

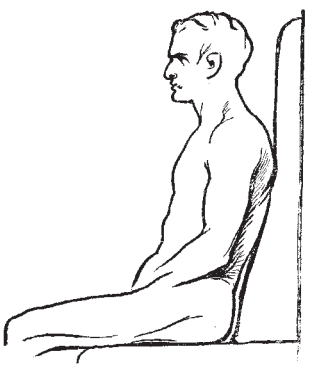

FIG. 4.

the necessity of a continual balancing movement, the centre of gravity being shifted every time the head and thorax sway to one side or the other. Such balancing

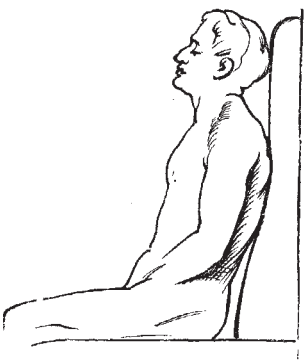

FIG. 5.

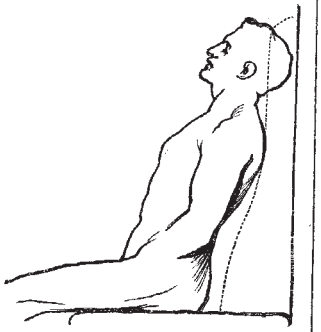

FIG. 6.

movement is necessarily also attended by a certain expenditure of energy. To allow the upper part of the body to remain comfortably at rest there must be supports for the back, the shoulders, and the head. So far as these are wanting, the body will tend of itself, unless counteracted by an effort of will and nervous force, to bend forward, till at last the forehead finds the knees to lean on. The position of the body in sitting is all the easier, and its rest all the more complete, the more decided is the inclination of the back of the seat and the more obtuse is the angle formed by the trunk and

FIG. 7.

the thighs. Seats such as the *dormeuses* realise the most favourable conditions in this respect.

Fig. 2 represents a man comfortably seated and propped. The back of the seat supports him principally under the shoulder-blades, offers the chest a depression to sink in, and altogether keeps the upper part of the body in a free and easy position. Fig. 3 shows the same person in a similar position, but with his head resting

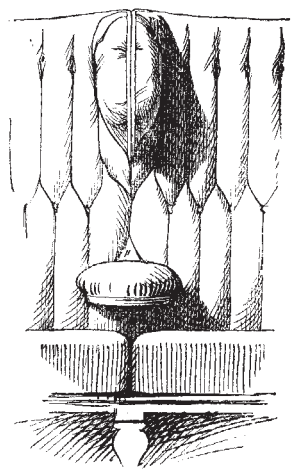

FIG. 8.

behind. In both these figures the back of the seat is seen exactly in profile, and to the writer of the article such seems the construction which is most convenient in railway carriages.

Fig. 4, on the other hand, represents the profile of a man seated as passengers are in many of our actual first-class carriages. His position is perceived to be a forced one in contrast with that just noticed, and alto-

gether disagreeable. Fig. 5 shows exactly the stiff attitude the head is compelled to take in order to rest.

Finally, Fig. 6 reproduces the comfortable position indicated in Fig. 3, and at the same time represents the profile of the back of the seat actually in use in our railway carriages. On comparing this profile with the position of the man comfortably supported, the following defects in the back of the seat are observed :—

1. It is too vertical.

2. It allows an empty space between the lumbar vertebræ and the lower extremity of the shoulder-blade exactly at the place where one is in the habit of putting a cushion "behind the back," as it is called.

3. It is at least half a foot too high, and so makes it impossible for the head to rest behind. It is customary to make the back of the seat tally with the height of a man of average size seated bolt upright.

Under the actual conditions, such as they have been

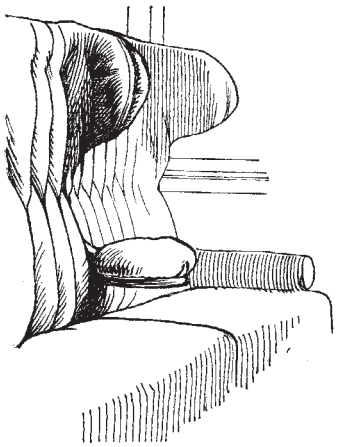

Fig. 9.

described, what becomes of the traveller when sleep at length overtakes him? Little by little he slides down on his seat till the lower extremity of his shoulder-blades, which has most need of support, finds the most sensible projection, which, as the backs of our railway carriages actually are, is precisely where it is least serviceable—at a point, namely, on a level with the region of the pelvis. Lastly, the head inclines forward or to the side, if it does not bury itself in the breast (Fig. 7).

Fig. 8 gives a front view of the face of the bench serving as the back of the seat. In the centre is seen a stuffed projection, on each side of which a passenger may rest his cheek. The shoulder, getting no separate support, must contrive to lodge itself between this stuffed projection and a kind of plateau fixed in the side of the back of the seat, and which, situated about a hand's breadth above the seat, offers a resting-place to the elbow (Figs. 8 and 9).

A NEW PRINCIPLE OF MEASURING HEAT

THE following method is intended to fulfil some conditions which probably will be more and more urgently required in the progress of modern science :—

1. *Measurements of heat should be executed at constant temperature, i.e. without the aid of thermometers.*—Every variation of temperature during calorimetric experiments causes unavoidable errors and necessitates corrections and compensations. The accuracy of the thermometric method ["method of mixture," of Regnault], which now predominates among experimentalists is unrivalled, only in those cases where the amount of heat to be measured is developed in the course of a few seconds or minutes ; it is seriously impaired whenever the experiment lasts longer, while the influence of the corrections for radiation, &c., increases proportionately with the duration of the operation. The first method used in thermo-chemical investigations, the ice-melting method of Lavoisier and Laplace, as well as the modern calorimetric method by Bunsen, avoids this inconvenience by executing all measurements at the melting-point of ice. Bunsen's ice calorimeter is, however, not exempt from corrections. Every physicist familiar with the use of this instrument will also, like the author, be well acquainted with its capriciousness. Bunsen prescribes that the calorimeter should be placed in a large vessel filled with absolutely pure snow. Although I have had abundant quantities of the purest snow at my disposal, I do not hesitate to declare, having tried, in company with Prof. Nilson, a whole winter to obtain reliable results with the original arrangement of the inventor, that the instrument would be impracticable for use without the improvement devised by Schuller and Wartha, viz. to immerse the calorimeter in a vessel containing ice and pure water at 0° C. Still the advantage of this arrangement is not to prevent variations in the position of the mercury index, but to make them quite *regular*. These variations are declared by some physicists to depend upon the vacillation of atmospheric pressure, but I think that the real

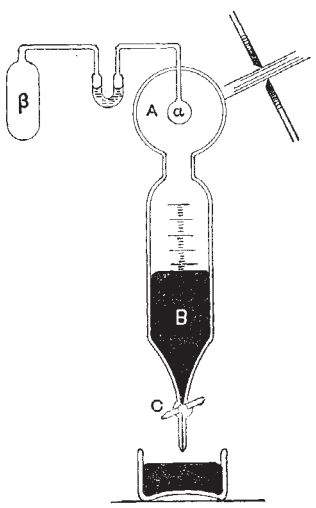

Fig. 1

cause of the unsteadiness of the index of the instrument lies in the peculiar behaviour of the ice in the vicinity of its melting-point. It was believed hitherto (and Bunsen's method theoretically rests upon this assumption) that ice at 0° C. suddenly changes its specific volume from that of ice [= 1·090686][1] to that of water [= 1·000000]. I admit that this assumption *may* be true with regard to *absolutely pure ice*, but in every kind of frozen water which contains the smallest trace of impurity (which is unavoidable if the water has been boiled assiduously in a glass vessel) the transition of ice into liquid water is not sudden, but gradual, *and begins already a little below* 0° *C.* Such ice does not attain its maximum of volume exactly at 0° C., but some hundredths or tenths of a Centigrade degree below 0° (dependent upon its relative purity). Graphic representation[2] shows that the co-ordinate of specific volume of the ice comes not to a *point d'arrêt* at zero, but moves upon the rapidly-sloping branch of a curve just in the immediate vicinity of the melting-point. Now suppose the water in the external vessel to be either a little purer than that of the calorimeter, or *vice versâ*. In the

[1] This number, which is almost identical with that of Bunsen, was found by the author in his research "Upon the Properties of Water and Ice," "*Vega*-expeditionens vet. iakttagels," Bd. ii. p. 275.

[2] See the paper "Upon Water and Ice," by O. Pettersson, *l.c.*